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RECOMMENDATIONS FOR THE

PRODUCTION OF PEAS

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Contents

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Numerous experiments and surveys indicate that certain production practices have a direct effect on both yield and quality of peas. The variations in yield, from more than 5000 pounds to less than 1000 pounds per acre of shelled peas of comparable maturity, suggests that these differences are at least partially due to cultural practices. A grower has little control over fluctuations in temperature and moisture caused by weather conditions, which undoubtedly account for a portion of the difference in yield of peas, but usually he can follow certain cultural practices.

With careful attention to all of the important cultural practices and to the control of disease and insects, and with favorable weather, you can expect an average yield of at least 3000 pounds of fancy peas per acre and yields of even 4000 to 5000 pounds would not be unreasonable. If, however, you overlook any one of these practices, yields may be considerably reduced. Growers who do not have suitable land for peas should not grow the crop because of the strong probability of poor yields. With consistently good yields, financial returns are rewarding.

Culture

Well-drained soil

Peas require a uniform, fertile, well-drained soil. Soil drainage, more than any other requirement, determines success or failure in growing peas. A soil with good surface drainage is not necessarily well drained. Internal drainage of the soil may be influenced by texture, which is determined by particle size or by structure as indicated by granular, blocky, or platy aggregates of soil particles. Soils with fine textures, such as clay soils, are more poorly drained than soils of coarse texture composed mostly of sand. Granular, blocky, or single-grain structure soils are better drained than soils of platy structure. When judging a soil for drainage, either dig a small hole, from 2 to 3 feet deep, in several areas of the field or use a soil auger to determine the nature of the subsoil.

In addition to proper texture and structure, well-drained soil has a topsoil and a subsoil with a bright uniform color. In an imperfectly drained soil, the topsoil is gray with mottling deep in the subsoil. A wet soil usually has a dark subsoil, indicative of a high organic-matter content, with mottling close to the surface. Presence of an impervious hard pan in the subsoil is a definite indication of poor drainage.

A poorly drained soil is cold in early spring when peas are planted because of its high water content. In such soil, seeds germinate slowly. Peas are very sensitive to poor soil aeration due to poor drainage. Soils that are poorly drained in early spring are often droughty as peas approach maturity because of the shallow root system of the peas and the small reservoir of readily available moisture in such a soil.

In two surveys made in 1945 and 1953 (table 1), there was a definite correlation between soil drainage and the yield of peas. The peas grown on well-drained soil produced at least twice as much per acre as did those grown on poorly drained soil. Honor crop-pea growers, in a 4-year survey (1945 to 1948), selected from those with the top 10 per cent yields of peas with tenderometer values less than 110, produced these outstanding crops with but few exceptions on well-drained soil.

Table 1. Effect of soil drainage on pea yields

Drainage	Peas per acre	
	1945 (71 fields)	1953 (323 fields)
	Pounds	*Pounds*
Excellent		3,060
Good	2,420	2,510
Fair	1,290	2,010
Poor	780	1,350

Fertilization

Peas respond well to liberal amounts of mixed fertilizer as measured by increased yields and higher quality. Peas well fertilized remain in fancy grade longer than when poorly fertilized. The slow rate of maturity of well-fertilized peas results principally from the effect of abundant nitrogen.

As an average fertilizer recommendation for peas in New York State, apply 500 pounds of a 10–10–10 fertilizer on sandy soils and 600 pounds of an 8–16–8 fertilizer on loam soils. Fertilizer experiments in New York, Michigan, Minnesota, and Washington indicate that the ideal fertilizer placement for peas is to band fertilizer 2 inches to the side and from 1 to 1½ inches deeper than each row of seed. A new drill designed for this type of fertilizer placement is now available in New York State. Growers who do not have the new fertilizer attachment to band fertilizer, should drill the fertilizer separately and as deeply as possible

Plots show the results from the right (left) and the wrong (right) way to use fertilizers on peas

before they plant peas. Drill the pea seed directly after drilling the fertilizer so as not to disturb the soil after applying the fertilizer. Never place fertilizer in contact with pea seed, because it might severely injure the germinating seedlings.

A survey of 313 fields of peas in 1953 shows that the growers who placed fertilizer in contact with the seed had yields that averaged considerably less than those of growers who applied the fertilizer in a separate operation (table 2). This difference was much more marked when growers applied at least 500 pounds per acre of a 10–10–10 fertilizer or its equivalent. The difference was not so great among growers who used less than 500 pounds of 10–10–10 fertilizer. This indicates that there is more fertilizer injury from higher rates of application when fertilizer is placed in contact with the seed than when it is drilled separately.

Often, supplemental applications of nitrogen are needed in addition to the application of a complete

Table 2. Effect of rate and placement of fertilizer on pea yields—1953 survey of 313 fields

Fertilizer rate	Fertilizer placement			
	In contact with seed		Separate from seed	
	Fields	Yield	Fields	Yield
	Number	*Pounds*	*Number*	*Pounds*
More than 500 pounds 10–10–10	6	1,910	39	2,720
Less than 500 pounds 10–10–10	60	2,260	208	2,420

Table 3. Effect of soil acidity and fertility level determined by soil test on pea yields—1945 survey

pH	Peas per acre	
	Phosphorus less than 8; potash less than 75	Phosphorus more than 8; potash more than 75
Range	*Pounds*	*Pounds*
Less than 5.5	1,490	2,080
From 5.5 to 7.5	2,560	2,690

fertilizer. Broadcast nitrogen in the form of calcium cyanamide at the rate of 300 pounds per acre, or 200 pounds per acre of ammonium nitrate, on previous crop residue or on the cover crop before you plow. As an alternative, you may apply the ammonium nitrate as a top dressing when the blossom buds first appear. This application should be made when the foliage is dry, to prevent burning.

Lime

Fertilizer nutrients are more readily available and higher yields of peas may be expected when the pH of the soil is between 5.5 and 7.0, with an optimum of 6.5.

Peas are often used as a nurse crop for new seedings of clover or alfalfa, which are very sensitive to soil acidity. Thus, liming to pH 6.5 benefits the clover or alfalfa as well as the peas.

Soils vary in the amount of lime needed to change the pH a given amount. A clay loam may require four times as much lime as a sandy soil, with a silt loam intermediate in lime requirement as shown in table 4.

Table 4. Tons of ground limestone required to raise the pH of the plow layer to 6.5

Soil texture		Degree of acidity		
		Slight (from 6.1 to 6.4)	Moderate (from 5.6 to 6.0)	Strong (5.5 or below)
		Tons	*Tons*	*Tons*
Coarse—	sands, sandy loams	½ to 1	1 to 2	2 to 3
Medium—	loams, silt loams	1 to 2	2 to 3	3 to 6
Fine—	silty clay loams, clay loams	2 to 3	3 to 4	4 to 10

If you grow peas in rotation with potatoes and need a relatively low pH, drill 500 pounds of ground limestone with the pea seed to raise the pH enough for good growth of the peas and yet not above pH 5.4 to encounter difficulty with scab on the potatoes. Never use hydrated lime in combination with pea seed because it will injure the germinating seedlings.

Plant early

Plant peas as early as possible in accordance with scheduled plantings by the heat-unit system to facilitate harvesting. Plantings made in April invariably yield more than those made in May with the varieties now available.

Plant shallow

Shallow planting is important, especially if you plant peas early. At this time, surface moisture of the soil is generally adequate and the peas germinate more quickly if planted in the warmer soil close to the surface. To insure rapid and uniform germination, plant peas no more than 1 inch deep.

Seed treatment

The cost of seed is a major expense in the production of peas because good yields require a relatively large volume of expensive seed. Growers have reduced this cost by making a fungicidal seed treatment which results in a greater percentage of field germination than if the seed is not treated. Spergon, which in some experiments has resulted in an increase of 50 per cent germination as compared with that of untreated seed, is recommended for pea-seed treatment.

Planting rate

To reduce the cost of seed, some research workers have skipped rows in the planting operation or reduced the amount of seed planted in solid plantings. This naturally reduces the number of plants to an acre. The planting rate of peas is usually based on the number of bushels of seed planted per acre.

Table 5. Effect of time of planting on pea yields—1953 survey of 322 fields

Date planted	Fields	Yield per acre
	Number	*Pounds*
April 1 to 15	88	2,780
April 16 to 30	162	2,340
May 1 to 15	56	1,860
May 16 to 31	15	1,680
June 1 to 15	1	1,180

There is, however, such a wide range in the size of seed of different varieties, such as 3000 seeds per pound for Superior as compared with 1670 seeds per pound of Bridger, that *plants per yard of row* is a much more satisfactory way to determine planting rate.

The proper planting rate should be determined for each variety on the basis of its habit of growth, whether single-stemmed or branching. Plant single-stemmed varieties, such as Alaska and Surprise, at the rate of approximately 18 plants per yard of row. Plant branching varieties such as Perfection, at the rate of 16 plants per yard of row. Also allow an extra amount of seed for the percentage germination and usually from 10 to 20 per cent extra seed for the expected reduction in field germination as compared with that observed in the laboratory.

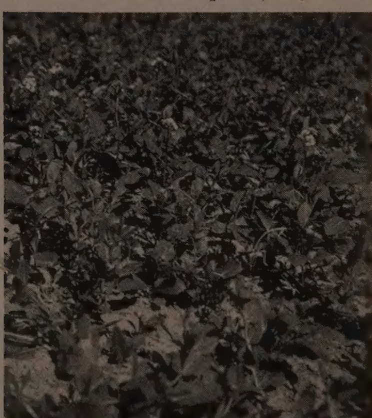
Roll or cultipack

Roll the pea field immediately after planting with a slat roller or cultipacker to settle the soil uniformly around the seed, thus facilitating uniform germination. Uniform germination is important because it tends to insure even maturity of the crop. Since fields of peas are harvested when the most advanced peas are mature, any conditions that cause lack of uniformity result in reduced yields of those plants growing in areas of the field that have been delayed in maturity. Rolling also pushes surface stones into the soil so that they do not interfere with the mower bar when the peas are harvested.

Weed control

Although peas are plagued with many different kinds of weeds,

Weeds in peas (left) can be controlled with dinitros (right)



chemicals are available that control the great majority of annual broadleafed and grassy species. If weed competition is severe, the pea crop suffers and yields are not maximum. If peas are not underseeded to hay or pasture mixes, you may make a pre-emergence application of the dinitros, Sinox PE, or Dow Premerge, at the rate of 3 pounds per acre of active ingredient. When you use peas as a nurse crop for legumes, do not apply chemicals until the peas and weeds form a protective canopy over the seeding or when the peas are from 3 to 6 inches tall. Since the toxicity of dinitro to plants is influenced directly by temperature, the recommended rate of application is dependent on the maximum mid-day temperature of the day when the peas are sprayed. The amount of dinitro to use at a temperature range of 60° to 80°F. is given in table 6. Do not spray peas when the temperature is less than 60°F., because of the probability of poor weed control, or at temperatures more than 80°F., when the peas may be injured by the chemical. PE and Premerge can be safely applied in as little as 25 gallons of water per acre.

Table 6. Recommended rate of Sinox PE or Dow Premerge for post-emergence application on peas

Temperature (F.)	PE or Premerge
Degrees	*Rate per acre*
80	¾ pound or 1 quart
70	1⅛ pounds or 1½ quarts
60	1½ pounds or 2 quarts

Irrigation

Lack of soil moisture as peas approach maturity often limits growth. In experiments at the Agricultural Experiment Station at Geneva, supplemental irrigation resulted in a significant increase in yield for 3 years (1952 to 1954). In the irrigated plots maturity was delayed an average of ½ day for the 3-year period.

Table 7. Response of Perfection peas to irrigation, average of 1952, 1953, and 1954

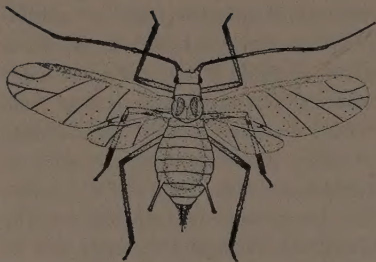
	Acre yield	Tenderometer
	Pounds	
Irrigated	4,270	106.2
Not irrigated	3,990	108.4

Insect Control

Two insects, the pea aphid and the pea weevil, are a problem to pea growers in New York State. Every season fields have to be checked for the pea weevil. Infrequently treatments are necessary for the control of pea aphids.

Pea aphid

The pea aphid (*Macrosiphum pisi* Kaltenbach) is an important insect in New York State and is most destructive in some seasons. In some years reduction in yield is small, while in others losses are



Adult pea aphid

great. Weather conditions play an important part in the development of this insect.

This plant louse is nearly 3/16 inch long and light green in color. In most of New York State it spends the winter in the egg stage on host plants such as alfalfa and clover. The eggs hatch in spring, and the first generation feeds on the host plant. Winged forms develop and fly to pea fields to feed upon the young pea plants. These aphids multiply so rapidly under favorable conditions that a heavy infestation may develop in less than ten days' time.

The amount of injury depends upon the time and the extent of the infestation. Only a few aphids may kill pea plants when they are small. The leaves, blossoms, and pods may be attacked. These become thickened and curled. Feeding on the blossoms may markedly reduce the set, and the pea pods may curl, shrink, and become only partly filled with peas.

In addition to the injury from feeding, pea aphids may transmit virus diseases. Many of these diseases are picked up from legumes where the aphids overwinter. Early transmission of virus may prevent the setting of a crop. In later infections, pods become tough and difficult to shell out mechanically and the quality of the peas is appreciably lowered.

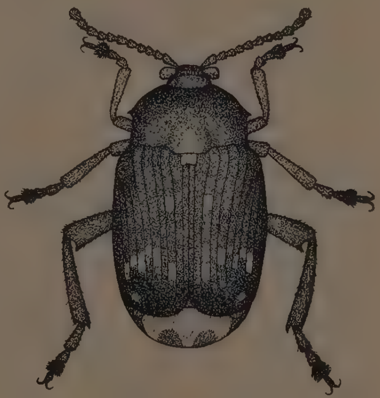
You can control pea aphids with malathion or parathion. Make regular and systematic checks to detect the presence of aphids on the fields. Early appearance of the aphids usually means control measures are necessary, especially if hot, dry weather follows. Wherever *mosaic* may be a problem, begin treatment when you see the first aphids. Apply *parathion,* 1 pint 25% emulsifiable per acre or 1% dust, or *malathion,* from 1½ to 2 pints of 50% emulsifiable per acre or 4% dust. The materials may be applied by airplane at the rate of 3 to 5 gallons of water per acre, or 40 to 50 pounds of dust per acre. Check thoroughly from 3 to 5 days after application to see whether additional treatments are necessary.

Pea weevil

The pea weevil (*Bruchus pisorum* Linn.) is present in New York State most seasons. It is a small snout beetle, 1/5 inch long, brownish in color, mottled with gray, white, and dark brown; its wing covers do not extend to the tip of the abdomen.

The adult weevil passes the winter under trash in the field, in fence rows, and under bark of trees. The weevils fly into pea fields at about the time the blossoms appear. They lay their eggs on living, green pods. The larva or grub enters the pod soon after hatching. Development takes place in the pea from larva to adult, with the adult emerging in summer or late fall and seeking a protected spot to pass the winter.

To control the pea weevil, plow the soil where peas were grown during the first part of August. Applications of parathion or malathion at the same rates as those for the control of pea aphid are necessary in areas where peas are grown for processing. Sweep the pea fields systematically and regularly, particularly around the edges of the field and next to the woods and hedgerows, to determine the presence of this insect. Treat any field that shows one weevil per 100 sweeps. To determine the need for additional treatments, check from 3 to 4 days after the first treatment. Make the first application when about 50 per cent of the peas are in full bloom and before many pods are formed. A second application is usually needed from 5 to 7 days later, particularly for midseason and late-maturing varieties. In late-maturing varieties where you plan to make three applications, the interval between applications should be about 5 days.



Adult pea weevil

Disease Control

Several diseases may afflict New York peas. These are blight, wilt, near wilt, root rot, powdery mildew, and enation mosaic. With the exception of the mosaic, all of these are caused by fungi; therefore, long rotations are advisable to minimize their prevalence. General control measures that have proved helpful include:

1. **Plant the seed early in well-drained soils that have not grown peas for 4 years.**
2. **Grow peas in fields at least 80**

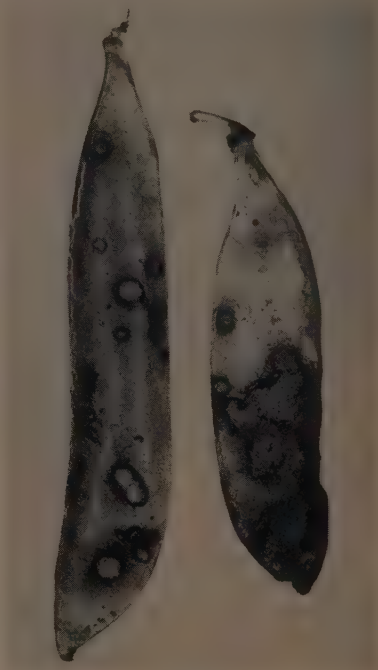
rods from old pea fields and pea-vine silage stacks.

3. Use western-grown disease-free seed.
4. Treat the seed with Spergon, Arasan, or Captan.
5. Use fairly heavy applications of commercial fertilizers.
6. Thoroughly control aphids.

Blight

Blight may be caused by either *Ascochyta* or *Mycosphaerella* fungi. The leaves develop small purple dots or fairly large concentric circles. On very susceptible varieties, the whole leaf may shrivel. Pod spotting is evident as sunken, circular, tan spots with dark margins. The stems develop black to purplish streaks, especially noticeable near the point of attachment of an infected petiole. Under severe conditions, the plant may not emerge or may die soon after emergence.

Control. Steps 1, 2, 3, of the control measures outlined are especially important. Inoculum is carried in seed and in infected plant debris; thus the use of clean seed and the avoidance of old pea fields are paramount. Seed treatment or use of foliage fungicides has not been successful.



Blight

Wilt

Wilt is a Fusarium fungus disease that causes overall dwarfing accompanied by rolling and distortion of the small leaflets. The leaves lose turgidity and are paler than normal. After foliage symptoms develop, you will note an orange-brown discoloration of the vascular system that extends well above the soil line.

Control. Since the fungus can live indefinitely in the soil, rotation is of no benefit. The use of resistant varieties offers the best method of control. New varieties are constantly becoming available. Dr. Dickson (University of Wisconsin) lists the following as resistant: W. R. Alaska, Wisconsin Early Sweet, Resistant Surprise, Climax, Wiscon-

sin Perfection, Prince of Wales, Perfected Wales, Teton, Glacier, Ranger, Bonneville, Early Perfection, Pride, Freezonian, Wasatch, and Shoshone.

Near wilt

Near wilt is caused by a race of the same Fusarium fungus that causes the true wilt. Symptoms of the two diseases are somewhat similar except that near wilt develops slower and later. Its optimum temperature for growth is higher than that for true wilt. The water vessels turn brick red instead of orange brown, and the discoloration generally goes up to the growing tip. Near wilt is usually not found in circular spots in a field as is wilt but rather as scattered infected plants. Sickly near-wilt plants may be attributed to root rots, inadequate fertility, or drouth. Most wilt resistant varieties are susceptible to near wilt.

Control. The only hope for control lies in the development of resistant varieties. Delwiche Commando is the only variety homozygous for resistance to both near wilt and wilt. This is a midseason wrinkled pea.

Root rot

Root rot may be caused by several different fungi, including *Fusarium solani pisi, Aphanomyces euteiches, Rhizoctonia solani,* and others. Rot often begins at the tips of the tiny feeder roots and soon affects the main root. Sometimes all the roots are destroyed, leaving only shreds below the seed. In a certain type of root rot, the outer part of the taproot can be slipped easily from the main portion. The *Fusarium* organism attacks the lower stem near the seed and grows in both directions, turning the stem dark brown or brick red.

Control. Control is very difficult because the fungi live indefinitely in the soil. Root rots are more severe in wet seasons and on low-lying, poorly drained soils. Also, retarded early growth favors root rot; thus good soil preparation and adequate fertilization should reduce losses from root rots.

Powdery mildew

Powdery mildew is caused by a race of the same fungus that attacks beans. The white talcum-like coating is most likely to develop in cool seasons with few splashing rains. Leaves, stems, and pods may all be affected. The leaves become dwarfed, yellowed, and misshapen. The fungus is not seed-borne.

Control. If mildew appears, immediately apply a sulfur and lime, or talc, dust mixture (6 parts of sulfur, 4 parts of lime or talc). A new chemical looks very promising but needs further testing in New York. Crop rotation and deep fall plowing reduce inoculum.

Enation mosaic

Enation mosaic is perhaps the most serious of several virus dis-

eases of peas in New York State. The first symptom is clearing of the veins in newly developed leaflets. Soon mottling and crinkling follow. Terminal growth is retarded, resulting in stunting. Enations or raised areas characteristically develop on the leaflets and pods accompanied by malformation of the pods. Aphids give most field transmission, although the virus can be spread by mechanical means. Barton and Schroeder at the New York State (Geneva) Agricultural Experiment Station are making excellent progress in developing canning varieties with resistance to this virus.

Control. Until resistant varieties become available, strict control of the aphid vector by use of insecticides is the only feasible measure.

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